PATENT SPECIFICATION

328,410

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COMPLETE SPECIFICATION.

An Improved Method and Apparatus for Irradiating Substances.

I, ERNST BUHTZ, of Lessingstrasse 21, Berlin, N.W., Germany, of German nationality, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to a method of and an apparatus for irradiating substances distributed in thin layers with ultra-violet light and other chemically active rays.

It was already known to distribute substances centrifugally in the form of thin layers for this purpose by allowing liquids to flow into the middle of cup-shaped, more or less large vessels having an irradiating apparatus disposed in the centre. Large velocities had to be employed in order to spread out the liquid so that, from the bottom of the cup-like vessel, it rose up on the side walls in a thin layer and left the centrifuge over the edge of the vessel, and consequently the time during which the radiation could act on the liquids was too short for many purposes of application.

According to the present invention the substance is distributed into a thin layer by supplying it to the middle of a flat disc which is rotated. The irradiating apparatus is movably disposed above the disc. The liquid flung off the disc is collected in a container.

The source of radiation may be disposed in an annular manner about the central feed of the substances to be radiated. In this way the source of radiation may be brought much nearer to the whole surface of the liquid to be radiated than is possible in the cup-shaped centrifuges, where the liquid layer is on the wall. Further, the liquid is distributed into a sufficiently thin layer on the flat disc if the latter is rotated more slowly than is necessary with cup-shaped centrifuges, so that the substances to be irradiated are exposed much longer to the action of the ultra-violet light. Suspensions or fine powder may also be distributed to a sufficiently thin layer on the disc.

One particular advantage of the method according to the present invention lies in the fact that the oxygen of the surrounding air does not penetrate into the spread-out aqueous liquid or melted substance, perhaps on account of the high surface tension of the latter, and consequently undesirable oxidations, which spoil the taste of the liquid, do not occur. Thus, the taste of milk was not spoiled by irradiation, and it therefore did not need to be treated in an atmosphere of carbonic acid. The taste of train oil was better after irradiation than before.

Of course, two or more different substances may also be separately fed on to the rotating disc, which then react with one another more rapidly or in a particular manner, under the influence of the chemically and physically active rays. In this way, for example by simultaneously supplying toluene and bromine and irradiating, the bromine may be introduced into the side chain of the toluene, and the condensation of phenols and formaldehyde and a series of other chemical changes, particularly polymerisations, may be accelerated.

The arrangement according to the present invention, instead of being used with ultra-violet rays, may also be used to influence the spread-out liquids chemically or physically by means of high frequency discharges or X-rays. The disc may be provided in the middle with a cup-shaped recess and its surface may be roughened.

In the accompanying drawings an apparatus is shown in which the method of the present invention may be carried out. The collecting vessel is denoted by G. If necessary it may be provided with a double casing through which water, ice or steam may be led, for cooling or heating purposes. A hollow tube W passes through the bottom of this vessel; the hollow plane disc S, which may be made of glass, porcelain or metal, is attached to the shaft L. Cooling or heating means may be supplied to the disc through the hollow shaft. The rotation is produced by means of a band pulley R and may be regulated. Above the centre of the flat disc S is the supply device E for supplying the liquid to be irradiated. A

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mercury vapour lamp is so arranged around this filling device that the vapour chamber U surrounds the supply tube in an annular fashion. The height of this mercury vapour lamp may be altered so that the intensity of the radiation can be regulated.

When the apparatus shown in Fig. 1 is in use, the liquid supplied through E to the rotating disc is flung off towards the periphery by the centrifugal force, in layers which are thinner the higher the speed of rotation of the disc. In this way, at high speeds of revolution it is possible to produce quite thin films over the disc. Naturally such thin films may be irradiated efficiently more rapidly than those which flow away in irregular layers under gravity, e.g. on an inclined plane.

If the rotating disc is cooled from below during the radiation more favourable results are obtained than if only previously cooled material is brought into the zone of the rays, for the thin liquid films immediately assume a high temperature because of the very large heat emission from the lamps. Filters have been inserted between the object to be irradiated and the source of rays in order to cut out the heat rays, but these filters, however, very soon reach a high temperature and then no longer absorb heat rays quite apart from the fact that they have a considerable adverse effect on the activity of the ultra-violet rays.

Fig. 2 shows partial section across A B in Fig. 1.

The irradiation of milk was so carried out, for example, that 1 litre of milk per minute was applied to a disc 35 cm. in diameter rotating at 60 revolutions per minute. The irradiated milk, contrary to milk irradiated according to other methods, showed no unfavourable change in taste at all. Dry milk could be irradiated in the same apparatus, in which case 500 g. of dry milk were supplied per minute.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A method of irradiating with ultra-violet light and other chemically active rays substances distributed centrifugally in the form of thin layers, characterised by the feature that the thin layers are produced by supplying the substances to the centre of a flat disc, rotating slowly, the irradiation being effected by quartz lamps movably disposed above the said flat disc.

2. A modification of the method of irradiating substances claimed in claim 1, characterised by the feature that the substances are supplied to the rotating disc in the form of suspensions or fine powders.

3. An apparatus for carrying out the process claimed in claim 1 or 2, characterised by the feature, that the source of radiation is disposed in an annular manner about the central supply of the substances to be irradiated.

4. The improved method of irradiating substances substantially as described.

5. The improved apparatus for irradiating substances, substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 28th day of March, 1929.

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328,410 COMPLETE SPECIFICATION 1 SHEET

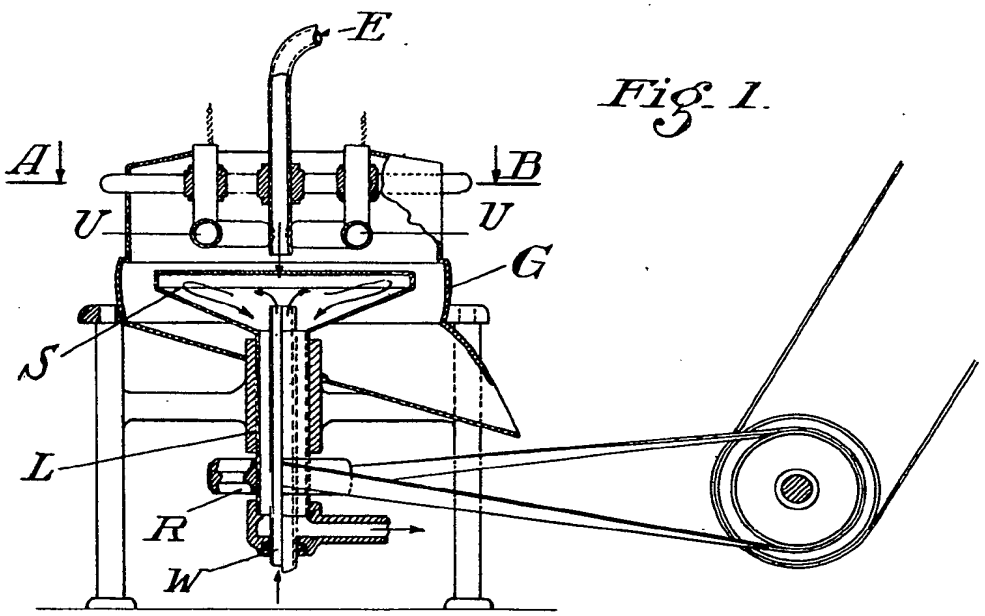

Fig. 1.

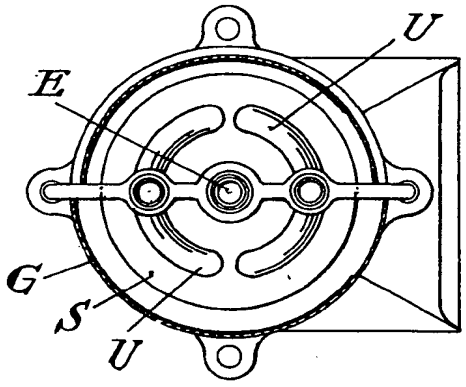

Fig. 2.

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